



Original Article

Aristolochia mulunensis (Aristolochiaceae), a New Record and Notes on Taxonomy, Distribution of some *Aristolochia* Species for the Flora of Vietnam

Lai Viet Hung^{1,2}, Nguyen Trung Thanh², Do Van Truong^{3,*}

¹National Institute of Medicinal Materials, No. 3B Quang Trung, Hoan Kiem, Hanoi, Vietnam

²Faculty of Biology, VNU University of Science, 334 Nguyen Trai, Thanh Xuan, Hanoi, Vietnam

³Department of Biology, Vietnam National Museum of Nature, Vietnam Academy of Science & Technology, 18 Hoang Quoc Viet, Cau Giay, Hanoi, Vietnam

Received 14 January 2019

Revised 11 March 2019; Accepted 14 March 2019

Abstract: *Aristolochia mulunensis* Y.S. Huang & Yan Liu, an endemic species to Guangxi, China, is newly recorded for the flora of Vietnam. The article discusses the taxonomy and distribution of some *Aristolochia* species in Vietnam, namely *A. petelotii*, *A. balansae*, *A. xuanlienensis*, *A. quangbinhensis*, and *A. tadungensis* are. Additionally, the morphological features of the capsule and seeds of *A. petelotii* and *A. balansae* are described for the first time.

Keywords: *Aristolochia*, *Aristolochia mulunensis*, distribution, new record, Vietnam.

1. Introduction

Aristolochia L., the largest genus of Aristolochiaceae family, comprises approximately 500 species distributed throughout in the tropical and subtropical regions (Wagner et al. 2012) [1]. Currently, 24 *Aristolochia* species belonging to two subgenera are known from Vietnam, of which seventeen are in subgenus *Siphisia* and seven are in

subgenus *Aristolochia* (Do & Nghiem 2017, Pham et al. 2018) [2, 3].

While conducting a taxonomic revision of *Aristolochia* for the flora of Vietnam, we found out a set of specimens at NIMM herbarium, collected in Ha Giang province, probably misidentified to *Aristolochia shukangii* Chun et How (nom. nud. in herb.) that was later synonymized to *A. kwangsiensis* W.Y. Chun & F.C. How ex C.F. Liang (Hwang

* Corresponding author.

Email address: dovantruong_btt@yahoo.com

<https://doi.org/10.25073/2588-1140/vnunst.4867>

et al. 2003) [4]. Detailed re-examination of these specimens and studies on the protologues and type specimens of previously known *Aristolochia* species revealed that these specimens completely match with *Aristolochia mulunensis* Y.S. Huang & Yan Li, a recently described new species from Guangxi province, China (Huang et al. 2013) [5]. Therefore, we here report *Aristolochia mulunensis* as a new record for the flora of Vietnam. The description, illustrations, taxonomic notes and comparison with the morphologically similar species are given.

Many *Aristolochia* species in Vietnam such as *A. balansae*, *A. petelotii*, *A. xuanlienensis*, *A. quangbinhensis*, and *A. tadungensis* have been still known only from the type locality (Ho 2000, Ban 2003, Huong et al. 2014, Do et al. 2014, 2015) [6-10]. However, our recent field investigations of the diversity of *Aristolochia* through National Parks and National Reserves in Vietnam confirmed new distribution areas of these species. Furthermore, the capsule and seeds of *A. balansae* and *A. petelotii* have not yet been seen (Franchet 1898, Schmidt 1935, Ho 2000, Ban 2003) [6,7,11,12] which are firstly described here.

2. Materials and methods

Survey of herbarium specimens: During the preparation of a taxonomic revision of *Aristolochia* for Vietnam, approximately 200 specimens were examined from the major herbaria: CPNP, DR, HN, HNU, IBK, IBSC, K, KUN, L, MO, NIMM, P, SGN, VNM, and VNMN.

Field collecting: Observation of living plants allowed comparison of morphological characters and coloration of the perianth (utricle, tube, and limb) which are most important to identify species within *Aristolochia* and often impossible to observe in dried specimens.

Identification: The macromorphological features were analyzed by using an optical microscope (Stemi DV4; LEICA S8 APO) based on the specimen sheets and notes in the field

observations. The morphological characters of studied specimen were compared with previously described species on the basis of protologues and type specimens.

3. Taxonomic treatment

New *Aristolochia* record to the flora of Vietnam

Aristolochia mulunensis Y.S. Huang & Yan Liu, Ann. Bot. Fennici 50: 175 (Figure 1).

Perennial, woody lianas, young branches climbing. Root stock globose or nearly rounded. Stem terete in cross section, young branches densely dusty yellow to brownish hirsute, old stem with deeply striate bark. Petiole 4-12 cm long, densely brownish-hirsute. Leaf blade cordate to orbicular, 9-25 cm long, 12-21 cm wide; leaf apex obtuse or acute; leaf base cordate or auriculate, sinus 1.5-2.2 cm deep, 0.6-1 cm wide; adaxially glabrous, abaxially densely hirsute; margin entire, brownish-hirsute; basal veins 3, palmate; secondary veins four pairs, pinnate; venation reticulate rather sunken on the adaxial surface and clearly prominent on the abaxial surface. Inflorescence cymose on young branches and old woody stems, each 2-4-flowered; inflorescence axis 2.2-3.2 cm long, pendulous, densely brownish-hirsute. Bracteole subulate, clasping the axis, 3-5 mm long, 1.5-2 mm wide, both surfaces densely brownish hirsute. Pedicel 1.2-1.5 cm long, curved, densely hirsute. Ovary oblong, 11-12 mm long, 3-4 mm in diam., densely hirsute. Perianth horseshoe-shaped, purple. Utricle ellipsoid-shaped, 1.1-1.2 cm high, 0.5-0.6 cm in diam. Tube cylindrical, 1.6-1.8 cm high, 0.5-0.6 cm in diam.. Limb unequal 3-lobed, the lobes valvate in pre-anthesis, dark-purple and outside densely hirsute, during anthesis margins of all lobes expanded, forming a subrotunded-discoid shaped, usually reflexed, nearly quadrilateral, 2.2-3 cm in diam; outer surface of the limb lobes purplish, densely brownish-hirsute, inner surface dark-purple, densely covered protuberance of the same color, margin slightly revolute.

Annulus present with a circular flange, ca. 5-6 mm in diam.. Throat purple with white dots. Gynostemium 3-lobed, 4-6 mm high, 2.5-3 mm

in diam., white, three lobes with obtuse apices, smooth. Anthers oblong, 2.5-3.0 mm long, yellow. Capsule not seen.



Figure 1. *Aristolochia mulunensis* - A. branch with inflorescence; B. adaxial leaf surface; C. cymose and front view of open flower. A: herbarium sheet at NIMM; B-C taken by D.V. Truong.

Type: China. Guangxi, Hechi city, Huanjiang contry, Mulun National Natural Reserve, alt. 614 m a.s.l., 27 Apr 2012, Yu-Song Huang et al. ML1425 (holotype IBK!; isotype IBK!)

Ecology and Phenology: *Aristolochia mulunensis* grows on the foothills of forests of limestone areas. Flowering in April-May.

Distribution and Ecology: *Aristolochia mulunensis* was previously reported from

Guangxi province, China. During recent investigations, we also found this species in Northern Vietnam (Ha Giang).

Ethnobotany: *Aristolochia mulunensis* is used medicinally. The rootstock is used for treatment of diuretic, nephritis and hepatitis diseases.

Taxonomic notes: *Aristolochia mulunensis* is most similar to *Aristolochia kwangsiensis* Chun et How ex Liang by having a cordate to orbicular

leaf blade and densely hirsute on abaxial leaf surface. However, it clearly differs from the latter by the following morphological characters of perianth (purple vs. pale green), inner surface of limb lobes (densely covered protuberance vs. densely covered protuberance), and throat (purple with white dots vs. exclusively yellow).

Additional specimens examined: Vietnam: Ha Giang prov., Meo Vac distr., Lung Chinh comm., 29 May 1973, L.M. Xu2048 (NIMM).

New distribution areas of some *Aristolochia* species in Vietnam

Aristolochia petelotii Schmidt, Repert. Spec. Nov. Regni Veg. 32: 95 (Figure 2A-B).

Type: VIETNAM. Lao Cai. Sa Pa, Ta Phinh Van, *Petelot 4418* (P02028702, holo.!).

Distribution: China (Yunnan) and Vietnam (Lao Cai, Ha Giang and Cao Bang).

Notes: Schmidt (1933) [12] originally described and illustrated *Aristolochia petelotii* from the flowering specimen *Petelot 4418* (P) collected from Ta Phinh Van community, Sa Pa district, Lao Cai province, Vietnam. Until now, it has been known only from the type locality (Nguyen 2003) [7]. Based on the recent field investigation, we also found out this species occurring in Ha Giang and Cao Bang provinces, Northern Vietnam. Additionally, the morphological characters of capsule and seeds are firstly described here based on the fruiting specimen collected from Ha Giang province (*T.V. Phan et al. TB-10078* (NIMM)). Capsule is cylindrical, 5.5-6.5 cm long, 2.2-2.5 cm in diam., distinctly 6-angled, dark-brown, angles villous, becoming glabrescent, basipetally dehiscent. Seeds are ovoid, 6-7 mm long, (3-) 4-5 mm in diam., non-winged, one surface is convex, and the another surface is deeply concave, both surfaces are smooth.

Additional specimens examined: LAO CAI. Sapa, Ta Phinh Van, Sep 1932, *Petelot 4418* (P); 1942, *Petelots.n.* (VNM); Ban Khoang, 31 Aug 2001, *N. Tapet al. 5677* (NIMM); 29 Mar 2003, *N.D. Phuong et al. 7122* (NIMM); Ta Giang

Phin, Suoi Thau, 6 Oct 2001, *N. Tap & N.D. Phuong 5672* (NIMM); 29 Mar 2003, *N.D. Phuong & N.T. Huyen 7122* (IMM); 14 Jan 2013, *D.V. Truong 22* (VNMN, DR); 17 Apr 2013, *D.V. Truong 22* (VNMN, DR). Bat Xat, Y Ty, Mu Phu Chai, 5 Oct 2001, *N. Tap et al. 5670* (NIMM). - HA GIANG. Quan Ba, Thai An, Ba Tien, 16 Dec 1999, *N.D. Phuong & D.V. Son 7476* (NIMM). Bac Me, Phieng Luong, 22 Apr 2015, *P.V. Truong et al. TB-10078* (NIMM). - CAO BANG. Nguyen Binh, Phia Oac-Phia Den National Park, 27 Oct 2013, *D.V. Truong 65* (VNMN, DR).

Aristolochia balansae Franch, Joirn. de Bot. 12: 311 (Figure 2C-D).

Type: VIETNAM. Hanoi. Ba Vi National Park, 18 Oct 1887, *Balansa 3159* (P00623809, holo.!, K, iso.).

Distribution: Endemic to VIETNAM (Ha Noi, Ninh Binh and Thanh Hoa)

Notes: Franchet (1898) [11] originally described *A. balansae* from a flowering specimen only that collected from Ba Vi mountain, Northern Vietnam. Later, Nguyen (2003) reported that *A. balansae* also occurs in Lao Cai, Hoa Binh, and Vinh Phuc without specimen cited. However, the recent study and observation confirmed that the specimens were collected from Lao Cai, Hoa Binh, and Vinh Phuc belonging to other species, namely *A. fangchi* Y.C. Wu ex L.D. Chow & S.M. Hwang (Do et al. 2015) [10]. Furthermore, during recent field investigation, we collected more the flowering and fruiting specimens of this species at the type locality and the surrounding other areas, Pu Luong Nature Reserve, Thanh Hoa province and Cuc Phuong National Park, Ninh Binh province. By these observations, the morphology of capsule of *A. balansae* is firstly described here. Capsule is narrowly cylindrical, brown, 10-12 cm long, 2.0-2.2 cm in diam., basipetally dehiscent. Seeds are ovoid, 6-8 mm long, 4-5 mm in diam., non-winged, one surface is convex and the another surface is deeply concave, both surfaces are smooth.

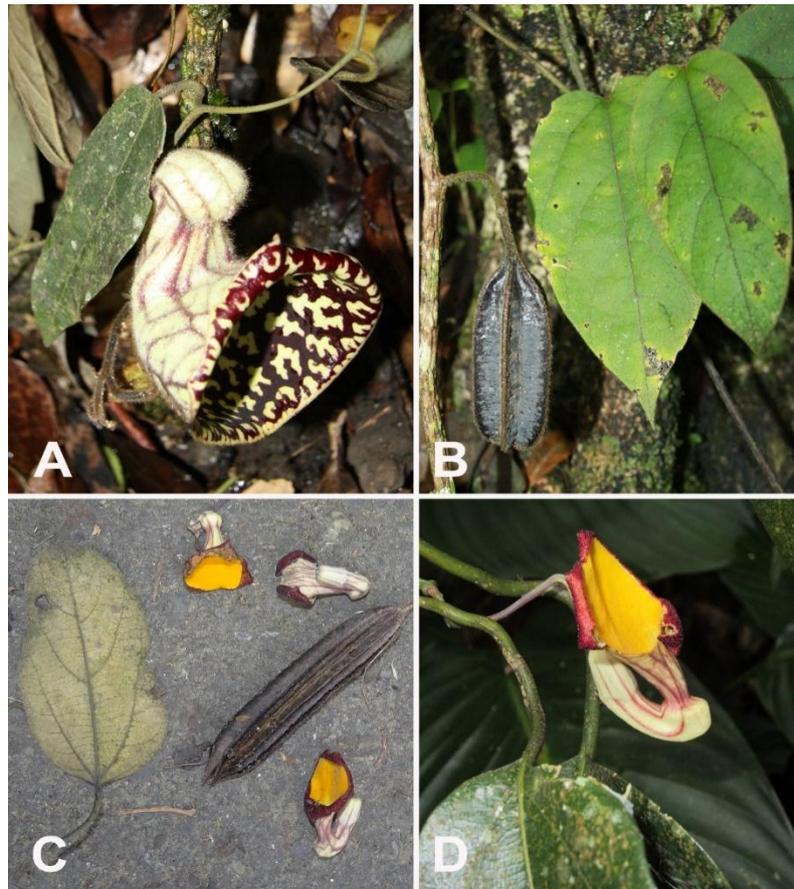


Figure 2. *Aristolochia petelotii* (A. perianth; B. capsule) and *A. balansae* (C. leaves, perianth and capsule; D. close up of perianth). A-B taken by P.V. Truong at Phieng Luong, Bac Me, Ha Giang; C-D taken by D.V. Truong at Pu Luong Nature Reserve, Thanh Hoa.

Additional specimens examined: HANOI. Ba Vi National Park, Apr 1909, *s.n.* (P), 14 Oct 2012, *V.D. Hung.s.n.* (VNMN); 6 Jan 2013, *D.V. Truong 01 & 02* (VNMN, DR). - NINH BINH. Cuc Phuong National Park, 24 Apr 2013, *D.V. Truong 41* (VNMN, DR). - THANH HOA. Pu Luong Nature Reserve, Oct 2014, *D.V. Truong 60* (VNMN).

Aristolochia xuanlienensis Huang N.T.T., Quang B.H. & Ma J.S., *Phytotaxa* 188 (4): 176 (Figure 3A-B)

Type: VIETNAM. Thanh Hoa, Xuan Lien Nature Reserve, 7 Nov 2011, *Hai D.V., Quang B.H., Cuong N.T., Vu D.Q., Thanh B.V., and Thanh T.X. XL 129* (holotype HN!; isotypes: CSH).

Distribution: Endemic to VIETNAM (Thanh Hoa and Ninh Binh).

Notes: Huang *et al.* (2014) [8] originally described *A. xuanlienensis* based on the type specimens collected from Xuan Lien Nature Reserve, Thuong Xuan district, Thanh Hoa province. However, the new distribution areas of this species in Cam Thuy district (Thanh Hoa) and Hoa Lu district (Ninh Binh) are here reported based on recent field investigations.

Additional specimens examined: THANH HOA. Cam Thuy, Cam Thach, Chay village, 25 Mar 1975, *N.V. Trai & N. Tap 2300* (NIMM); 7 May 2013, *D.V. Truong 34* (VNMN). - NINH BINH. Hoa Lu, Ninh Hai, Van Lam, 27 Feb

2000, *N. Tap et al.* 4986 (NIMM); 25 July 2017, *D.V. Truong* 130. (VNMN).

Aristolochia quangbinhensis T.V. Do, *Phytokeys* 33: 51 (Figure 3C-D).

Type: VIETNAM. Quang Binh, Minh Hoa, Hoa Luong, 3 Apr 2013, *D.V. Truong* 39 (VNMN, holo.!, DR, iso.!).

Distribution: Endemic to central VIETNAM (Quang Binh and Quang Tri)

Notes: *Aristolochia quangbinhensis* was firstly described on the basis of the type specimen collected from Hoa Luong commune, Minh Hoa district, Quang Binh province. Recent examination on *Aristolochia* collection at HN herbarium confirmed a new distribution area of this species in Trieu Nguyen commune, Dak Rong district, Quang Tri Province.

Additional specimens examined: QUANG TRI. Dak Rong, Trieu Nguyen, *P.K. Loc* HLF6009 (HN).

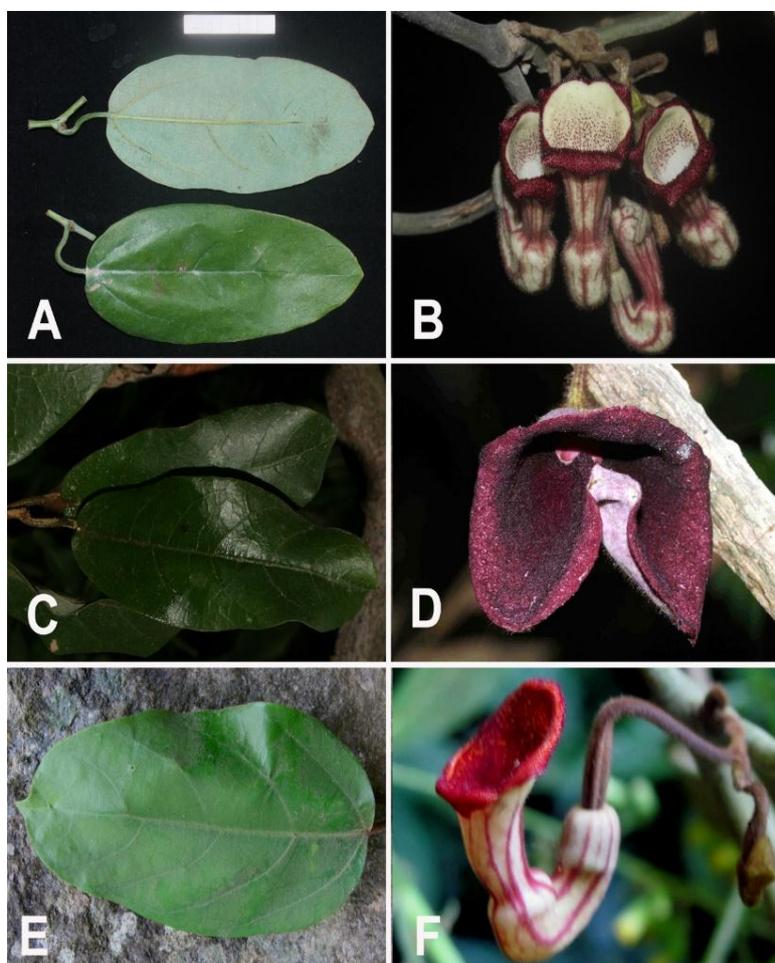


Figure 3. *Aristolochia xuanlienensis* (A. leaves; B. inflorescence and flower); *A. quangbinhensis* (C. leaves; D. close up of perianth); and *A. tadungensis* (E. leaves; lateral view of perianth). A-B taken by N.D. Trong at Hoa Lu, Ninh Binh; C-D taken by P.K. Loc at Dak Rong, Quang Tri; and E-F taken by D.V. Truong at Ta Nung, Da Lat, Lam Dong.

Aristolochia tadungensis T.V. Do & T.H. Luu, Syst. Bot. 40(3): 677 (Figure 3E-F)

Type: VIETNAM. Dak Nong, Ta Dung Nature Reserve, L.H. Truong TD 395 (VNMN, holo.!, SGN, iso.!).

Distribution: Endemic to southern VIETNAM (Dak Nong, Lam Dong, Gia Lai, and Kon Tum).

Notes: Do et al. (2015) [10] originally described *A. tadungensis* on the basis of the type specimen only which collected from Ta Dung Nature Reserve, Dak Nong province, southern Vietnam. However, our recent field investigations confirmed that *A. tadungensis* was also found out in some other protected forest areas such as Bi Doup-Nui Ba National Park (Lam Dong), Mang Den Nature Reserve (Kon Tum) and Kon Ka Kinh National Park (Gia Lai).

Additional specimens examined: LAM DONG. Da Lat, Xuan Truong, 7 Feb 2015, D.V. Truong 87 (VNMN); Ta Nung, 10 Feb 2015, D.V. Truong 91 (VNMN), 18 Jul 2018, D.V. Truong 147 (VNMN); Lac Duong, Da Sar, Bidoup-Nui Ba National Park, 28 Dec 2018, D.V. Truong 309 (VNMN). - KON TUM. Kon Plong, Mang Den Nature Reserve, 24 Dec 2018, D.V. Truong 273 (VNMN). - GIA LAI. Mang Yang, Kon Ka Kinh National Park, 26 Mar 2018, D.V. Truong & W. Fang VNM_CN 1083 (VNMN).

Acknowledgements

We are grateful to the curators and staff of the following herbaria: CPNP, DR, HN, HNU, IBK, IBSC, K, KUN, L, MO, NIMM, P, SGN, VNM, and VNMN for making *Aristolochia* collections available. Special thanks are to Phan Van Truong, Nghiem Duc Trong, and Phan Ke Loc for sharing the photos. This study is funded by Vietnam National Foundation for Science and Technology Development (NAFOSTED) under grant number 106-NN.03-2016.01 to T.V. Do.

References

- [1] S.T. Wagner, S. Isnard, N.P. Rowe, M.S. Samain, C. Neinhuis and S. Wanke, Escaping the lianoid habit: evolution of shrub-like growth forms in *Aristolochia* subgenus *Isotrema* (Aristolochiaceae), American Journal of Botany. 99 (2012) 1609-1029. <https://doi.org/10.3732/ajb.1200244>.
- [2] T.V. Do and T.D. Nghiem, Taxonomic notes on some *Aristolochia* species in Vietnam, Taiwania. 62 (2017) 216-218. <https://doi.org/10.6165/ta.2017.62.216>.
- [3] O.T. Pham, H.V. Lai, T.T. Nguyen and T.V. Do, *Aristolochia chlamydophylla* (Aristolochiaceae), a new record for the flora of Vietnam, VNU Journal of Science: Natural Sciences and Technology. 34 (2018) 69-72. <https://doi.org/10.25073/2588-1140/vnunst.4745>.
- [4] S.M. Hwang, L.M. Kelly and M.G. Gilbert, Aristolochiaceae in Flora of China, volume 5, Missouri Botanical Garden Press Beijing, St. Louis, 2003.
- [5] Y.S. Huang and Y. Liu, *Aristolochia mulunensis* (Aristolochiaceae) a new species from limestone areas in Guangxi, China, Annales Botanici Fennici. 50 (2013) 175-178. <https://doi.org/10.5735/085.050.0308>
- [6] H.H. Pham, *Aristolochia* in An Illustrated Flora of Vietnam, volume 3, Young Publishing House, Ho Chi Minh, 2000 (In Vietnamese).
- [7] N.T. Ban, *Aristolochia* in Checklist of Plant species of Vietnam, volume 2, Agriculture Publishing House, Hanoi, 2003 (In Vietnamese)
- [8] N.T.T. Huong, D.V. Hai, B.H. Quang, N.T. Cuong, N.S. Khang, D.Q. Vu and J.S. Ma, *Aristolochia xuanlienensis*, a new species of Aristolochiaceae from Vietnam, Phytotaxa. 188 (2014) 176-180. <https://doi.org/10.11646/phytotaxa.188.3.7>.
- [9] T.V. Do, T.D. Nghiem, S. Wanke & C. Neinhuis, *Aristolochia quangbinhensis* (Aristolochiaceae), a new species from central Vietnam, Phytokeys. 33 (2014) 51-59. <https://doi.org/10.3897/phytokeys.33.6094>.
- [10] T.V. Do, H.T. Luu, S. Wanke and C. Neinhuis, Three new species and three new records of *Aristolochia* subgenus *Siphisia* from Vietnam including a key to the Asian species, Systematic Botany. 40 (2015) 671-691. <https://doi.org/10.1600/036364415X689140>
- [11] A. Franchet, Plantarum sinensium ecloge secunda, Journal de Botanique (Morot), 12 (1898) 311.
- [12] O.C. Schmidt, Aristolochiaceae in Die natürlichen Pflanzenfamilien volume 2, 16B eds. A. Engler & K. Prantl. Leipzig: Engelmann, 1935.